

# DigitalNaturalism



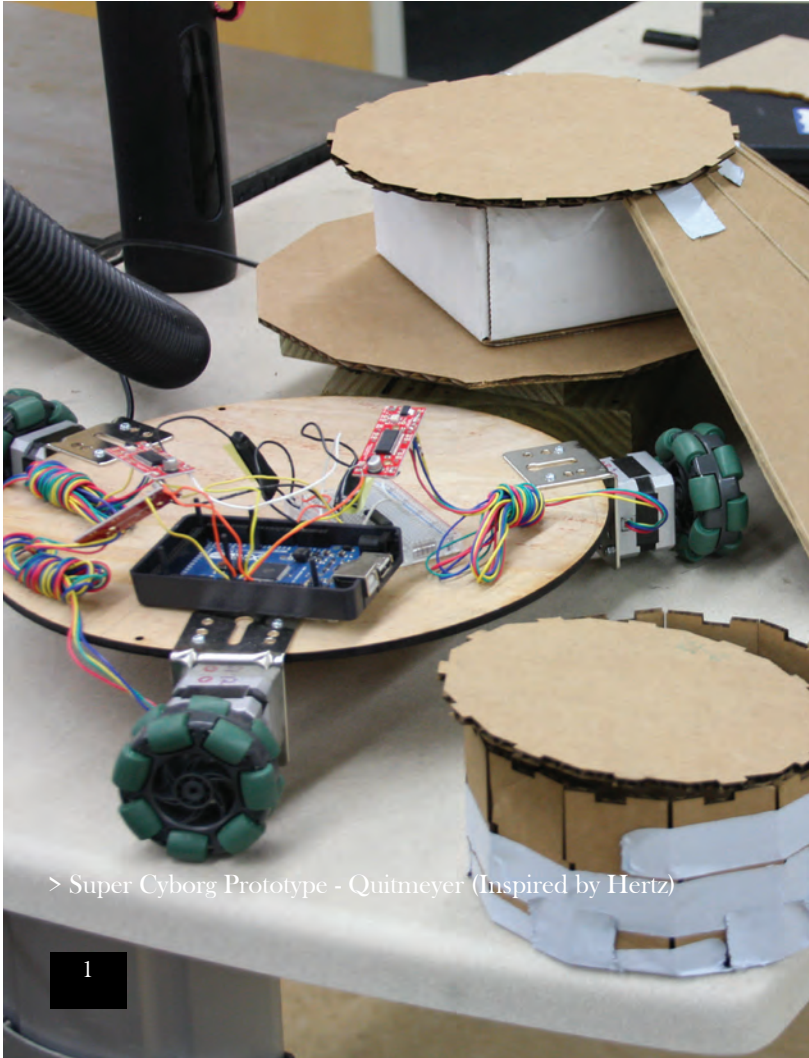
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[www.digitalnaturalism.org](http://www.digitalnaturalism.org)

## INSPIRATIONS

> Cockroach Controlled Robot - Garnet Hertz



> Super Cyborg Prototype - Quitmeyer (Inspired by Hertz)

## INSPIRATIONS

This booklet is a quick compilation of interesting artifacts designed to inspire humans to create artifacts and performances that promote novel engagements with the environment and living creatures.

This is given away free, and for educational purposes. Feel free to remix or redistribute these simple booklets, but try to maintain attribution to the original author's works.

URLs are typically long and ugly, and all of these artifacts can be found via a search engine and the supplied keywords.

If any authors are angry about their works being touted as inspirational and used as exemplars for learning, please let us know and we can remove references to you in future publications.

- Andy Quitmeyer



# CYBIOTIC



An interesting category exists of works which combine interactions between digital and biotic agents. Both organic and artificial systems can enact robust series of behaviors. The resulting actions can prompt new behaviors from the organisms and new insights for crafting interactions.

Cybiotic systems can also alter our perception of the creature and change its role in the environment. This arena has its roots in cybernetics and B.F. Skinner's exploration of organic control systems or ORCON. One of his earliest works, "Project Pidgeon," incorporated a parallel set of live pigeons to guide a missile to targets on the ground.

This idea (creature + robot) also serves as a bit of a "Hello World," starting problem in the world of animal-human-digital interaction. This led to the creation of many fish, roach, gerbil, and ant controlled robots. There are also myriad other means of creating interactive digital devices which stir up feedback between humans, animals, and their environments.



> Cockroach Controlled Robot - Garnet Hertz

GARNET HERTZ

### **Cockroach Controlled Mobile Robot**

A roach sits on an inverted trackball, and the pushing of its legs directs its robot body. As opposed to simple visual feedback however, the robotic side of the system transmits knowledge of the external world by varying the intensity of an array of LEDs shining towards the roach.

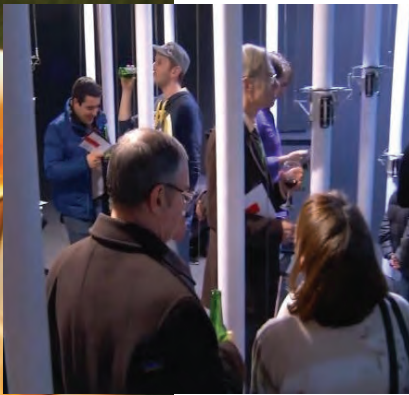
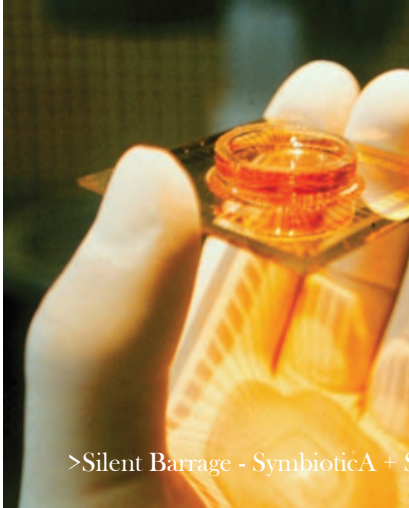


> Augmented Fish Reality - Ken Rinaldo

KEN RINALDO

### **Augmented Fish Reality**

The most advanced version of many art projects lending fish terrestrial navigational abilities, is “Augmented Fish Reality” by media artist Ken Rinaldo. Though, like the unsophisticated Sei-Gyo, the fish tracking only consists of four infrared sensors placed in corners of the tank, in this piece, several robo-fish combos simultaneously interact with each other and humans inside an arena.



> Silent Barrage - SymbioticA + Steve Potter



> Autoinducer - Andy Gracie

SYMBIOTICA - STEVE POTTER

## MEART - Silent Barrage

The work Silent Barrage literally places the humans into the mind of a rat. Tissues grow from embryonic rat neocortex into a “two-dimensional mono-layer” over a glass multi-electrode array. The electrodes can read the current activity of the neuroculture as well as pass stimuli back to the living tissue.

ANDY GRACIE

## Autoinducer

Autoinducer\_Ph-1, explores this potential ability of a digital agent to replace a biological organism. In southeast Asia farmers use a fast growing fern, Azolla, as a fertilizer for rice patties. Azolla’s fertile properties derive from its relationship with a symbiotic bacteria, Anabaena azollae. The nitrogen fixing abilities of the bacteria provide its host plant (and any nearby plants) with valuable nutrients enabling rapid growth. Autoinducer\_Ph-1 implants an additional layer of digital organisms into this symbiosis.

Gracie states, “The more the relationship between the real and synthetic bacterial colonies takes on a symbiotic nature the more nutrient will be delivered to the rice. If the relationship veers more towards the parasitic the rice will be starved of the elements it needs.”





>Ducks Feed People - DWIG

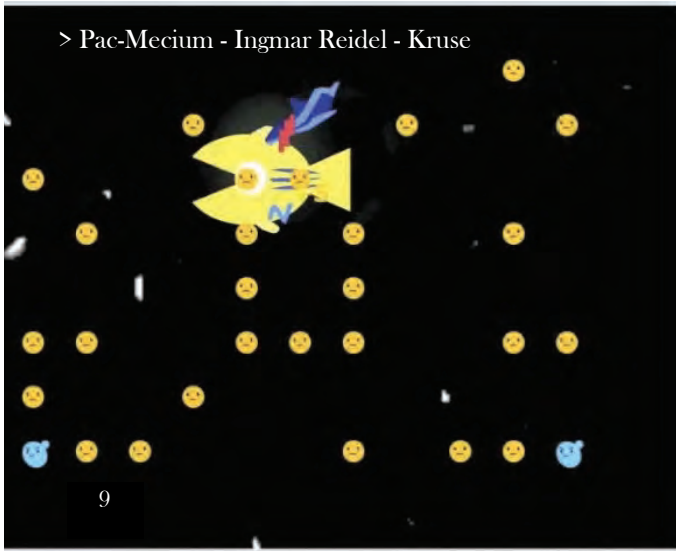


## DIGITAL WORLD AND IMAGE GROUP

### Ducks Feed People

In this simple cybiotic artifact, the movement of ducks in one area of a public park triggers the release of candy from a robotic duck head in the human area of the park. This performance inverts the traditional relationships between humans and ducks, and invites inspection concerning the ducks' underlying motivations and behaviors.

> Pac-Mecium - Ingmar Reidel - Kruse



## INGMAR REIDEL-KRUSE

### Pac-Mecium (Biotic Games)

These games use simple computer vision and galvanotactic or chemotactic indirect controllers to make cybiotic video games. The game tries to emulate the original Pac-man by having the human player try to make the biotic agent collect food while avoiding enemies. In PAC-mecium, these concepts are represented by digital simulacrum of similar entities in the paramecium's actual world. Pac-dots are replaced by virtual yeast food, and the ghosts are substituted with predatory, zebra-fish larvae which dart across the screen, penalizing the player for any paramecia "eaten." The lack of some traditional pacman game mechanics promote the more realistic rhetoric that paramecia possess no means of fighting back against their much larger predator.



> Bird Buggy - Andrew Gray



## CYBIOTIC CURATION AND TOUCH PROJECT

### Ludis Animalis

Ludis Animalis serves as a collection of projects that incorporate digital and animal feedback. Like Andrew Gray's Birdbuggy, or the videos of frogs and reptiles playing on iPads.

They also have projects of their own such as their "Touch Project" "which aims to create possibilities for humans and orangutans to play together. Using recent technologies - such as custom-made touch screens - we can build previously unreachable bridges between the two closely related species."

## AMY YOUNGS

### Rearming the Spineless Opuntia

Using a microcontroller, ultrasonic sensors, and a prosthesis, Amy Youngs builds a behavioral protective device for a creature that has lost its own defenses through evolution.

As she states, "The plant inside this device is both interactive with people and protected from them. Its metal armor closes up when approached and opens when people move away from it. Through cloning and micropagation technologies, humankind has engineered creations such as the Spineless Opuntia, a cactus that lacks its original defense mechanism against those who eat them. This sculpture embodies my impulse to protect this vulnerable, human-engineered creation. But it also reveals the folly of protection in its heavy reliance on technology."





## SITUATED PERFORMANCE

> Fluids - Kaprow (photo by Dennis Hopper)

In his book, *The Play of Nature*, Robert Crease argues for the primacy of the phenomenon in scientific research, and sees an appropriate analogue and tool in performance. For both Crease and Performance Studies founder, Richard Schechner, a performance amounts to the actual enacting of a script. These “restored behaviors” situated between ritual and play can take place consciously, unconsciously, in groups or individuals, in humans, animals, or even objects under Jon McKenzie’s subfield of “Techno Performance.” Schechner in fact argues that Ethology is actually a subset of performance studies that focuses exclusively on animals.

Overall, performances are embodiments of cultural, genetic, and physical forces temporarily brought into reality. Scientific experimentation as performances can reveal hidden structural forces or assumptions. The other benefit of performance is that as constituted phenomena themselves, they can be used to directly engage with phenomena and prompt the incarnation of novel phenomena. In his view, performance makes “phenomena appear more boldly, throwing it into greater relief.”



> “Fluids” flyer - Kaprow



During three days, about twenty rectangular enclosures of ice blocks (measuring about 30 feet long, 10 wide and 8 high) are built throughout the city. Their walls are unbroken. They are left to melt.

> Open Score - Rauschenberg and Kluver



ALAN KAPROW

**Happenings**

“A Happening is an assemblage of events performed or perceived in more than one time and place,” defines Kaprow. Happenings emphasize the continuity between art, society and the surrounding environment. They are simple scripts enacted in real life, in real places. Works like “Fluids” feature large rectangular structures assembled from ice blocks

E.A.T - ROBERT RAUSCHENBERG AND BILLY KLUVER

**Open Score**

The Group, Experiments in Art and Technology, put artists together with engineers to produce interactive mutating artworks such as Kluver and Rauschenberg’s “Open Score.” In this piece, Tennis rackets were wired with impact sensors and controlled the lighting in a crowded stadium. The work commenced with a game of tennis whereupon each volley back and forth would shut down one of the stadium lights. As the area grew dimmer, and the game more difficult to play,



> Duality - Art+Com

## ART+COM Duality

Duality is an elegant interactive work. Using an array of LED panels, and touch sensitive plates, passers-by are connected to their environment. When people step on the panels, their impact strength and location is sensed, and virtually displayed, and then made manifest into physical waves emanating from the same origin in the platform.

(DESCRIPTION BY) PUTNAM - THE DRAMA REVIEW

## Elephant Concert in the Jardin du Roi

With the dismissal of the royalty in the French Revolution, came the appropriation of the king's menagerie including two adult elephants. These elephants gained popularity among the citizens and proto-naturalists working in the garden. An idea arose to sate the desires of both camps. Putnam describes the event: "Departing from the age-old practice of inducing animals to perform for humans, a concert was arranged for these pachyderms in hopes of observing their reactions to a range of musical stimuli".

An orchestra performed variations of operas, anthems, and popular songs in different keys and with different instruments while observers recorded the pachydermal reactions as notes and commemorative drawings. Many times, performers would dynamically shift the musicality based on feedback from the elephants' reactions. This novel approach to early ethology exhibited a powerful ethological use of non-verbal performance. Putnam follows, "Rather than being represented in the static, symbolic practices of human language that were the cornerstones of knowledge and discourse, the kinetic nature of animals' reactions defied collection, analysis, and codification."

18



*Simulacre des instants de la génération,  
chez les Eléphants.*



> Mark Your Territory - Andrew Quitmeyer

ANDREW QUITMEYER

## Mark Your Territory

Mark Your Territory is another cybiotic project that explores ownership of digital and real-world spaces. Humans and animals alike are able to interact with the typically humans-only digital territory-claiming application, foursquare. It builds off ideas of semiochemicals, and investigates multifarious means of claiming spaces digitally, physically, and temporally.

Special markers are staked into areas but are only activated when urinated upon. Specific seeds inside each marker display ownership over long periods, and litmus paper provides an unbiased indicator of the owner. Since real urine is used, animals can now also participate in digital spaces.



19

>World's Deepest Bin and Piano Staircase - The Fun Theory



THE FUN THEORY

## World's Deepest Bin - Piano Staircase

Sponsored by Volkswagen, the Fun Theory creates digitally augmented interventions in everyday spaces. The World's Deepest Bin for example plays a motion triggered sound that simulates a bottomless fall when a peice of refuse is tossed in. The Piano staircase remediates a subway stairwell into a space for fun and expression in order to get people to try to exercise more and use the stairs.

In all of these projects, the computational behaviors are simple, but their situated design makes them powerful probes of human behavior.

20





>Best Buy - Improv Everywhere

IMPROV EVERYWHERE

## Best Buy

Improv Everywhere excels in performatively hacking social traditions in order to “create a scene.” Subtle alterations to traditional experience in areas of everyday life lead to sudden refiguring of these spaces. Projects like “Human Mirror” fill subway cars with identical twins sitting across from each other. “Reverse Times Square” uses dozens of accomplices walking and performing backwards to create a startling experience.

In “Best Buy” accomplices did nothing but show up at the retail store dressed in blur collared shirts and khaki pants (simulating the attire of the workers). The social norms were upset to the point where the police were even called.



21 >A Machine to See With> Blast Theory

BLAST THEORY

## A Machine to See With

The Group Blast Theory creating narratives, games, and experiences that interact with real people and real places.

“A Machine to See With” is a film where ordinary people get called in to play the lead. Individuals sign up, and get a call letting them know to be a specific place in the city at a certain time. From that point they are guided through the environment and the plot of the heist film in which they are participating. Locative media project need to be resilient enough to deal with, and promote novel encounters deviating from a typical script.



## ROMANTIC SCIENCE

Charlotte Sleight, in writing about the conflict between romantic or popular Natural History versus scientific or objective reporting, she brings forth the quote from Alan Ternes introduction in *Natural History* magazine (“Ants, Indians, and Little Dinosaurs”) “Naturalists may attempt to achieve a scientific objectivity toward the creatures they study, but fortunately for editors they invariably fail.”

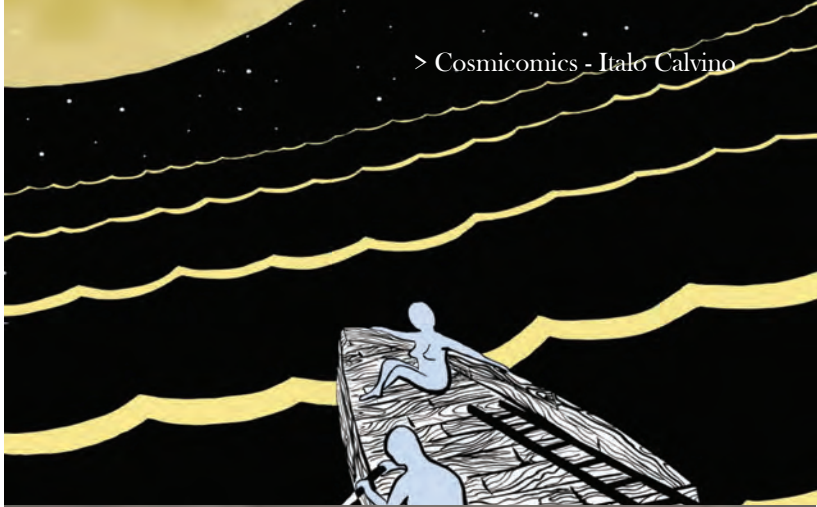
Many scientists and artists alike have explored the realms between the objective and imaginary, the rational and emotional. John Sennet, in his book, *The Craftsman*, argues that it is through artistry and the imagination that we can repair the shortcomings of our scientific tools. The detail of the fly’s eye was not possible through the cruddy optics available to Hooke and Wren at the time, and thus a learned artistry and tacit understanding of physical structures were used to imaginatively fill in the gaps.

Artistic pairings of science and culture can reveal the unseen structures and assumptions impacting each other.

> Hooke and Wren - Fly Head (1667)



> Cosmicomics - Italo Calvino



ITALO CALVINO

**Cosmicomics**

Cosmicomics is a series of surreal short stories which each begin with a scientific “fact” (though sometimes these “facts” are apocryphal). Calvino then crafts a story dealing with these natural phenomena in tandem with emotional concepts like “love,” “heartbreak,” “jealousy,” and “hate.”

> Green Porno “Bedbug” - Rossellini



ISABELLA ROSSELLINI - SUNDANCE CHANNEL

**Green Porno**

Rossellini whimsically acts out the mating rituals of many animals in this series of short films. She seeks to show the diversity of life as well as expose the “scandalous” activities of many of the prosaic creatures surrounding us. These films also work to highlight social impacts of humans into the spaces and behaviors of these creatures.



>Screaming Burgett's Frog - AA



> Guava, Spiders, Insects, Hummingbird - MSM

TIM FLANNERY + PETER SCHOUTEN  
**Astonishing Animals**

This book is not only a compendium of rare and interesting animals, it is also a florid, subjective detailing of their particularities. Flannery unabashedly speculates as to the subjective experiences of these creatures. In a whimsical manner he also secretly includes one fake animal to further prove just how astonishing the real world truly is.

MARIA SYBILLA MERIAN  
**Insects of Suriname**

A great early woman naturalist, Merian eschewed cultural norms and travelled solo or with her daughters to the far reaches of the world in the late 17th century.

There they created elaborately detailed paintings which remediate the traditional still-life and attempt to demonstrate living processes.

DEKE WEAVER  
**The Unreliable Bestiary**

Artist and scholar, Deke Weaver, harnesses the power of elaborate, multi-modal performances, to explore themes of myth and science concerning endangered animals. In his collection of performances, *The Unreliable Bestiary*, Weaver synthesizes anecdotes, animation, original scripts, dance, puppetry, and real world experiences with animals, in a widely encompassing and engaging approach. His sometimes massive performances physically and mentally bring audiences into fluid webs of facts, theories, and representations of animals in our society. He himself performs as his creatures, but these typically undergo shifting incarnations throughout the performance in the light of the creature's varying cultural and scientific depictions.



> "Elephant" *The Unreliable Bestiary* - Deke Weaver

# RESOURCES

A major difficulty in interdisciplinary work can be trying to uncover the techniques and resources that are seemingly commonplace for research and science particular to a certain field.

This is a quick, non-comprehensive listing of some helpful utilities, hardware and software resources, how-to guides, and project documentations. This list is curated from my own experience, and is targeted towards creating site-specific digital artifacts that can engage with animal and human behaviors.

> Milkscanner  
-Friedrich Kirschner





> Stone Spray Project - Petr Novikov,  
Inder Shergill and Anna Kulik



## PROGRAMMING

**Processing**  
**Arduino**  
**OpenFrameworks**

Getting a computer environment setup for programming can often be more difficult than coding the procedures themselves. These cross-platform systems aim to be self-contained packages for getting users up- and coding- as soon as possible.



> Soft-Circuit Continuity Tester - Hannah Perner-Wilson

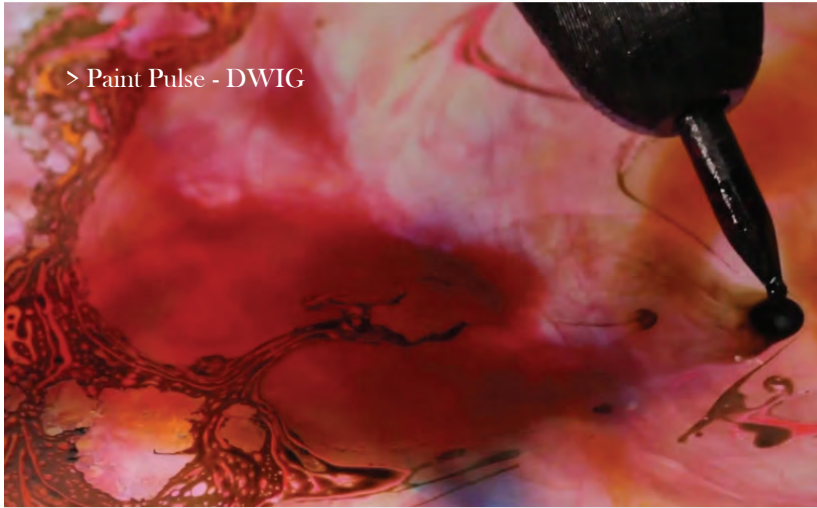
## TUTORIALS - PHYSICAL COMPUTING AND SOFT CIRCUITRY

**Instructables**  
**Adafruit**  
**MIT - High-Low Tech**  
**HOWTOGETWHATYOUWANT - [www.kobakant.at](http://www.kobakant.at)**  
**Make Magazine**  
**BackyardBrains**

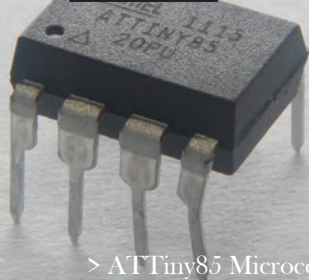
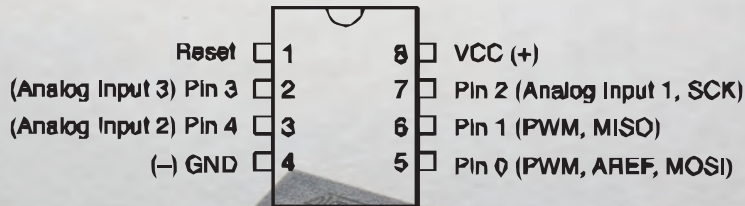
Actually building something always involves more factors than are ever planned for. Luckily many digital crafters have thoroughly documented their work and share instructions for getting your own projects up and running. Many of these sites are particularly geared towards physical computing (coding projects that interact with the real world as opposed to virtual simulations) and soft-circuitry (creating electronics outside the rigid worlds of metal and PCBs).



## > Paint Pulse - DWIG



### ATTiny45 / ATTiny85



## > ATTiny85 Microcontroller- Arduino

## MATERIALS

### McMaster-Carr Inventables Carolina Biological

McMaster is an amazing resource for getting very specific engineering materials with a catalogue of over half a million detailed parts. Inventables distributes objects with interesting capabilities and properties like ferrofluids, aluminum foam, and conductive foam. Carolina sells great equipment for catching and rearing animals.

## ELECTRONICS

### Sparkfun Mouser Digikey Jameco

Sparkfun is a great introductory store for learning physical computing. They sell kits, and often include tutorials and example code with their projects. More advanced users will find that they can sometimes find much better deals on components by purchasing them from more industrial organizations like Jameco.